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# THE GREEN LIBRARY

The challenge of environmental sustainability

# DIE GRÜNE BIBLIOTHEK

Ökologische Nachhaltigkeit in der Praxis

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**“Sustainability in all phases of the  
building’s life-cycle ...”**

A case study of the McClay Library, Queen’s University Belfast

**DE GRUYTER**  
SAUR

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## “Sustainability in all phases of the building’s life-cycle ...”

A case study of the McClay Library, Queen’s University Belfast<sup>1</sup>

**Abstract:** In 2009 Queen’s University Belfast opened its new £50 million library with 2,000 reader places and housing some 1.5 million volumes. The background to the project is described, as are the main features of the new library building. Trends in 21st-century library design, including the growing importance of energy-efficiency measures, are outlined. The focus of the paper is sustainability as exemplified in the design of The McClay Library at Queen’s University. Sustainability procedures used during the construction process are briefly described as are the five key sustainability principles which informed the design of the library throughout. Finally, the approach to managing sustainability on a day-to-day basis post-occupancy, with particular reference to the Green Impact Scheme, is discussed.

**Zusammenfassung:** Im Jahr 2009 eröffnete die Queen’s University Belfast ihre neue 50 Mio. £ teure Bibliothek mit 2.000 Arbeitsplätzen und Raum für 1,5 Mio. Bände. Beschrieben wird der Hintergrund des Projektes mit den wichtigsten Eigenschaften des neuen Bibliotheksgebäudes. Die Trends des Bibliotheksbaus im 21. Jahrhundert, einschließlich der wachsenden Bedeutung energie-effizienter Maßnahmen, werden skizziert. Der Schwerpunkt des Beitrags liegt auf der Nachhaltigkeit am Beispiel der McClay Library an der Queen’s University. Die Maßnahmen zur Nachhaltigkeit im Zuge des Bauprozesses werden kurz beschrieben, wie die fünf Hauptprinzipien der Nachhaltigkeit, die die Gestaltung der Bibliothek insgesamt bestimmten. Schließlich wird das Vorgehen behandelt, wie Nachhaltigkeit im Alltagsbetrieb des Gebäudes gesteuert wird, unter besonderer Berücksichtigung des Green Impact Scheme.

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<sup>1</sup> [www.qub.ac.uk/directorates/InformationServices/TheLibrary/TheMcClayLibrary/AboutTheMcClayLibrary/](http://www.qub.ac.uk/directorates/InformationServices/TheLibrary/TheMcClayLibrary/AboutTheMcClayLibrary/). Accessed on 26 January 2013.

# 1 Introduction

In August 2009 Queen's University Belfast opened the doors of its new library. This building brought together all of the services provided to non-medical users of the library, computing and media services as well as of the Language Centre. Most notably the new building enabled two of the major library branches, the Science Library and the Main Library, and a smaller short loan undergraduate library (the Seamus Heaney Library), to amalgamate, leaving only the Medical and Biomedical Libraries in separate buildings on the two main teaching hospital sites quite close by.



**Fig. 11.1:** The original building, designed by Ulster architect William Henry Lynn. © M. Patton.

The Main Library, which housed the collections in the arts, humanities, law and social sciences, had been based in a rather unprepossessing 1960s multi-storey, framed-construction tower block with a glass corridor linking it to the original old library building of 1862–1868, which was extended in 1911. The original building, designed by Ulster architect William Henry Lynn, is a delightful Ruskinian Gothic Victorian structure with brick and polychrome stonework, gables and gargoyles, banded tiles and ornamental tracery. In its day, “with its high roof and great west window, beneath which in winter, a huge fire blazed in the open grate, it seemed the very ideal of a library reading room” (Moody & Beckett 1959, 84). Indeed the



**Fig. 11.2:** The 19th century “very ideal of a library reading room”. © Creative Services, Queen’s University Belfast.

poet, Philip Larkin, who worked in the library in the 1950s, always commented very favourably on the atmosphere in the library, describing it as resembling, “a large church” (Larkin 1984, 3). Times change, however, and the ideal library of the late 19th and mid 20th centuries is by no means suitable for the 21st century with increasing student numbers (currently about 24,000 at Queen’s University) and the emphasis on digital information, group study, mobile technologies and sustainability.

The Science Library, which held the science, engineering, architecture and planning collections, was a more modern, system-built (SEAC) building opened in 1969. The building received a Royal Institute of British Architects’ award in 1970 probably mainly because it was an early, and successful, use of industrialized architecture rather than for any great architectural beauty or merit. Designed by English architects Twist and Whitley, it too was very typical of its time, having two large open-plan reading rooms with small windows and seating arranged around a central core of open access shelving and with closed access compact shelving on the lower ground floor. Like the Main Library tower it was also reaching the end of its useful life-span, and in an increasingly competitive world the

University needed top-quality library facilities preferably located in one central site to attract students.

## 2 Some 21st-century library trends

As the new century dawned, some were predicting the demise, or at least decline, of the physical library as a building type. It soon became obvious, however, that although the impact of technological, pedagogical and social change on library design was marked, “the library as a cultural and social symbol, a place for community interaction and celebration of learning continues to be hugely important” (Latimer 2011, 117). Libraries embraced the new technologies and users continued to want to come to library buildings to work with colleagues in well-equipped, well-managed environments with help on hand to assist them in exploiting electronic resources to the full. Geoffrey Freeman, whose firm *Shepley Bulfinch Richardson Abbott (SBRA)*<sup>2</sup> designed the new library at Queen’s University, noted that, “rather than threatening the traditional concept of the library, the integration of new information technology has actually become the catalyst that transforms the library into a more vital and critical intellectual center of life at colleges and universities today” (Freeman 2005, 2). Influential new university library buildings continue to open throughout Europe and indeed all over the world. The LIBER Architecture Group’s<sup>3</sup> *New library buildings in Europe* (Svobodová 2012) and other recent publications listed on their website confirm this; further evidence can be found by looking at entries in the “Designing Libraries” website.<sup>4</sup>

In the United Kingdom this trend was also clearly noticeable with new, extended or refurbished buildings for the Universities of Aberdeen, Cardiff, Edinburgh, Leicester, Sheffield as well as Imperial College and Central Saint Martins College of Art Library in London, and Queen’s University, to mention just a few. The two major library building awards in the UK, the Public Library Building Awards and, for academic library buildings, the SCONUL (Society of College, National and University Libraries)<sup>5</sup> Awards had no shortage of entries. What was particularly pertinent was that “energy-saving design featured prominently in all of the award-winning buildings” (Latimer 2012, 364).

Queen’s University had long planned to upgrade its existing library facilities and embrace the need to move from traditional collection-based spaces to

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2 [www.shepleybulfinch.com](http://www.shepleybulfinch.com). Accessed on 18 February 2013.

3 [www.libereurope.eu/free-tags/architecture-group](http://www.libereurope.eu/free-tags/architecture-group). Accessed on 26 January 2013.

4 [www.designinglibraries.org.uk](http://www.designinglibraries.org.uk). Accessed on 20 January 2013.

5 [www.sconul.ac.uk/](http://www.sconul.ac.uk/). Accessed on 26 January 2013.

service-driven, user-focused spaces. This was necessary to support increased student numbers, the move from printed to electronic resources, the demand for more group study and training rooms and for better facilities for Special Collections. In 2000 the University, recognizing the need to move with the times and keep up with the competition, included a new library in its corporate plan; a major fundraising drive was launched in 2001 to raise the money required for the new building. The fundraising initiative ran for over five years with £30 million coming from philanthropic sources and the balance of approximately £20 million being provided by the University and by the Northern Ireland Executive.

### 3 Sustainability in library design

Energy efficiency is increasingly playing a major role in the design of new and refurbished library buildings. Reducing the ecological footprint as much as possible through raising energy efficiency has to be a desirable goal for anyone involved in planning or designing a library. The recently published *ISO/TR 11219:2012* relating to the space, function and design of library buildings has a useful section on sustainable building (p. 120f.). It gives general recommendations to be taken into account at the early stage of the planning process as well as specific information on electric power, thermal performance, renewable energies and the conservation of natural resources. After many years when the collections were the main design concern and the storage of these collections dominated the architectural brief, the focus has moved to the user. Bright, airy, welcoming and comfortable spaces are the order of the day and natural daylight is again being welcomed into the library. So, too, are natural materials and the use of new environmental technologies. Sustainability issues impact on many aspects of library design including lighting, heating, ventilation, air-conditioning, pollution, waste, recycling and maintenance to mention only some. The two major environmental assessment methods BREEAM (Building Research Establishment Environmental Assessment Method)<sup>6</sup> used widely in Europe and LEED (Leadership in Energy and Environmental Design)<sup>7</sup> used in the United States set out approaches to environmental sustainability which can be seen in use in many modern library buildings.

Brian Edwards, in a recent article on sustainability in libraries, postulates that “sustainability is altering typological assumptions as well as detailed architectural approaches, leading to libraries that offer greater user satisfaction and

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<sup>6</sup> [www.breeam.org/](http://www.breeam.org/). Accessed on 26 January 2013.

<sup>7</sup> [www.leed.net](http://www.leed.net). Accessed on 26 January 2013.

hence are better places to read, meet friends, or study” (Edwards 2011, 191). Edwards goes on to make the important point that image matters in library design and that there is no more important message in the 21st century than one of environmental responsibility.

The first combined academic and public library in the UK, The Hive in Worcestershire, is just one recent example of a new library that had sustainability at the heart of the design; not just environmental sustainability but also service sustainability through the integration of five different service areas, and the promotion of sustainable communities.<sup>8</sup> Another is the University of Aberdeen Library where a great deal of thought and planning went into reducing book miles and “unnecessary movement through the building” (Leaner operation at Aberdeen 2010, 6). There are numerous such examples (as indicated above in discussing recent awards). Indeed to design a library in the 21st century without taking sustainable issues into account is unthinkable.

## 4 Sustainability in The McClay Library

Right from the outset sustainability was a critical factor in the design, construction and operation of the new McClay Library at Queen’s University, Belfast. Indeed, four undistinguished energy inefficient 1970s buildings were demolished to enable the new library to be built in the heart of the campus. The architects for the new library were the Boston-based practice, *Shepley Bulfinch Richardson Abbott (SBRA)*, in association with local architects *Robinson Patterson Partnership (RPP)*.<sup>9</sup> The aim of the project was to provide a high-quality learning environment and a world-class resource for research. The building had to provide seating for 2,000 readers, house a collection of approximately 1.5 million volumes and have a significant visual presence on the campus. It subsequently achieved a “Very Good” BREEAM rating and won the “Sustainability” category in the Royal Institution of Chartered Surveyors 2010 Awards.

The library echoes the style and materials – red brick and sandstone – of the University’s main mid-19th-century Gothic- and Tudor-revival building. Its highly fenestrated entrance tower takes some inspiration from the brick central tower of

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<sup>8</sup> [www.thehiveworcester.org/](http://www.thehiveworcester.org/). Accessed on 18 February 2013.

<sup>9</sup> [www.robinsonpatterson.com/](http://www.robinsonpatterson.com/). Accessed on 18 February 2013.





**Fig. 11.3:** Exterior McClay East elevation. © Creative Services, Queen’s University Belfast.

the main building, which in turn was based on the 15th-century gateway tower of Magdalen College, Oxford. The new library is a deep-plan building with a skewed multi-storey open atrium relating to the angled boundary with the adjacent Botanic Gardens, which were opened in 1827. The ground floor, soon to be remodelled to provide some 150 new reader spaces, houses the Borrower Services Desk and the Computer Helpdesk, the Short Loan collection, a large number of student workstations, training rooms and a small auditorium as well as a café outside the security point. When the library first opened there was an extended-hours reading room near the entrance to the building which was separated from the rest of the library by glazed beech screens and to which users could get access when the rest of the building was closed. It soon became obvious that this area was far too small and users wanted access to the book and journal collections as well as to the electronic resources. The solution was achieved in two stages: firstly the whole ground floor was opened for use; secondly, now, the whole library is open, often 24 hours a day at peak periods, with only security staff remaining on duty after the library staff leave at night.

The first floor houses the library administration offices, special collections, reading areas, group study rooms and stock shelved in both standard and compact shelving, all on open access. The second and third floors employ a similar layout broadly based on the collections for the Faculty of Arts, Humanities & Social





**Fig. 11.4:** Shelving with study spaces. © Creative Services, Queen's University Belfast.

Sciences and the Faculty of Engineering & Physical Sciences respectively. Throughout the building, and particularly to the south of the building overlooking the Botanic Gardens, there are views over attractive green areas. Noise is well controlled, both through the acoustic elements of the design and because of a carefully managed noise control policy. In addition, attractive and inspirational art works are provided throughout the library; at the entrance is a very accomplished bronze sculpture, entitled “Eco”, by the French artist Marc Didou. A full description of the library is given in an article in the journal *Perspective* (Tennyson 2009).

The focus of this chapter, however, is on the sustainability measures incorporated into the design of the building and the policies adopted post-occupancy to raise awareness of environmental issues and promote positive change. A Sustainability Action Plan was drawn up at the outset and energy efficient procedures were used during the construction process. The main contractor, *O'Hare & McGovern*,<sup>10</sup> operates an accredited environmental management system in line with ISO 14001 and the company ensured energy-efficient procedures during construction were identified, assessed and recorded. Targets were set for recycling

<sup>10</sup> [www.ohareandmcgovern.com](http://www.ohareandmcgovern.com). Accessed on 18 February 2013.



**Fig. 11.5:** At the entrance the bronze sculpture, entitled “Eco”, by the French artist Marc Didou.  
© Creative Services, Queen’s University Belfast.

five types of waste, and CO<sub>2</sub> emissions (water and electricity) were monitored against set targets. The site was awarded the maximum six construction-stage BREEAM points. The design of the building included spare capacity in the electrical and computer infrastructures for future development, and an open plan approach was adopted where possible to achieve maximum flexibility. Ease of access for maintenance and cleaning was incorporated into the design and a maintenance plan was prepared. Data are collected on energy, fuel and water consumption for review against targets on a quarterly basis.

Five key sustainability principles informed the design of the library throughout. These were:

- to reduce energy loads wherever possible;
- to provide energy input as efficiently as possible;
- to minimize plant operation times by defaulting to off or standby;
- to use the simplest and most user-friendly solutions;
- and to utilize passive systems to regulate the environment.



**Fig. 11.6:** The main atrium space brings daylight into the library building's core. © Creative Services, Queen's University Belfast.

The above principles were put into practice in the heat-recovery system, the natural-ventilation strategy, thermal-mass cooling, grey-water storage and recycling, floodwater attenuation, insulation, BMS (Building Management System) -controlled windows and window blinds, passive infrared and daylight sensing controls on lighting, and in the preservation of existing trees and some replanting.



**Fig. 11.7:** Automatic blinds to prevent glare and control heating in the reading areas. © Creative Services, Queen’s University Belfast.

The main atrium space in the library building brings daylight into its core; with its interior planting and skilful use of attractive acoustic panels to prevent sound travelling into the spaces on the upper floors which open on to it; this is a very popular place for students to study. The reading areas throughout the building are low-energy and naturally ventilated, providing a good working environment. A system of sensors, controls and automatic louvres maintain the temperature at a comfortable level and automatic blinds are centrally raised or lowered to keep the heat at a pre-set level in the reading areas. As Tennyson notes, “in summer the windows are opened and warm air from ground floor cellular spaces and the open upper floors is drawn naturally by stack effect into the atrium to be vented out via high level louvres. In winter the perimeter windows and louvres in the atrium are closed and warm air is taken through a heat exchanger at the top of the atrium.

The heat exchanger then preheats the fresh intake air, thereby significantly reducing the energy load” (Tennyson 2009, 61). Other energy-efficiency measures include using a ground-source heat pump to help with cooling, and collecting rainwater for use in the toilets.

Additional sustainability actions taken in relation to the library building included the selection of BRE Green Guide<sup>11</sup> “A”-rated materials. In selecting building materials and fixtures and fittings, embodied energy, performance and salvageability were all taken into account as well, of course, as appearance. Carpet tiles, rubber flooring and aluminium curtain walling all contain recycled elements and can themselves be recycled after use; all timber was obtained from *Forest Stewardship Council*<sup>12</sup> approved sources. The University promotes the use of public transport as part of its Travel Plan; 100 cycle stands, shower facilities, lockers and dry rooms have been provided as part of the library design. Since the Library is located on campus it has generated very little additional car traffic. A waste-management plan for the building has been implemented and is discussed further below. Although it is highly unlikely that the building use will change in the foreseeable future, flexibility was a key element in the design, which would facilitate re-use should the need ever arise.

## 5 Post-occupancy sustainability

The McClay Library has now been open for just over three years and sustainability remains important to the staff and users. Library staff take part in the University’s “Green Impact Scheme”<sup>13</sup> which aims to achieve a 21% reduction in carbon emissions by 2020. The Information Services Directorate, of which the library is a part, has 11 Environmental Champions whose job it is to encourage others to adopt greener and low-carbon behaviours. They motivate their colleagues to make quite small everyday changes that make a real difference to the environmental performance of the library. The programme looks at reducing waste and increasing recycling; increasing energy efficiency and reducing carbon emissions; increasing sustainable procurement; increasing sustainable transport; and improving communications relating to sustainability. The library achieved the bronze award in 2012 and is now going for gold.

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11 [www.bre.co.uk/page.jsp?id=499](http://www.bre.co.uk/page.jsp?id=499). Accessed on 25 March 2013.

12 [www.fsc.org/](http://www.fsc.org/). Accessed on 18 February 2013.

13 [www.green-impact.org.uk/](http://www.green-impact.org.uk/); [www.qub.ac.uk/sites/CarbonManagementatQueens/GreenImpactScheme/](http://www.qub.ac.uk/sites/CarbonManagementatQueens/GreenImpactScheme/). Accessed on 20 January 2013.





**Fig. 11.8:** Reading area relating to the angled boundary with the Botanic Gardens. © Creative Services, Queen’s University Belfast.

The reduction of waste and increase in recycling are major challenges in libraries. Staff and students are encouraged to think before they print and to print double-sided if they really need a printed copy. Alternatives suggested include printing summary pages rather than making multiple copies, or using online documentation, email and MS PowerPoint presentations. Increasingly users are encouraged, within the copyright legislation, to scan material to memory sticks. This not only saves paper but is very popular with students as it is a free service. Dedicated recycling bins for paper, plastic bottles, cans and glass are available on all floors and there are designated areas for flat-pack cardboard and for the recycling of ink and toner cartridges and batteries. An initiative to do away with individual waste bins in staff areas is under way, as large quantities of recyclable waste are thrown into such bins. These are gradually being replaced with central recycling and waste bins. The re-use of envelopes for internal mailings is actively promoted. An *A–Z Guide to Waste and Recycling* is available for staff and students on the University website.

Although the University has reduced its energy use by 6.29% in the past year, there is still much to be done in this area. It is a particular challenge for the library, with its heavy reliance on computer equipment, long opening hours, large



number of laptop users and large areas with little user control. To counteract this, much of the waste heat from computers in the machine room is recycled to heat the other areas in the library. Heating and ventilation timers are aligned with the library opening hours to avoid heat and light coming on when the library is closed. Staff are encouraged to use desk lamps rather than office lights and are asked to switch off lights and equipment when leaving an empty room and to switch off computer screens when they are away from their desks. Further advice includes switching appliances off at the plug rather than leaving them on standby, not leaving laptops and mobile phones on charge unnecessarily and taking responsibility for switching off shared electrical equipment overnight. Finally, all library users are encouraged to take the stairs rather than the lifts.

Procurement is another green impact theme. Paper and envelopes should be made from either recycled paper or from certified sustainable sources and, if environmentally friendly versions of other stationery products are available, they should be purchased. Fairtrade products are preferred when purchasing tea and coffee for meetings, as is local sustainable food. Tap water rather than bottled water is provided where possible and bottle-fed water coolers are being replaced with mains-fed versions.

Sustainable travel also comes in to the Green Impact Scheme. As mentioned above, cyclists are encouraged to use the library, with a range of facilities put in place and widely advertised to support this. Although not specific to the library, the University has a number of provisions to promote sustainable travel. These include discounts on purchasing bicycles and safety equipment, loans to buy annual travel commuter cards and a car sharing scheme.

The 11 Environmental Champions are an enthusiastic group with good communication skills and a real belief in their mission. A range of stickers and posters is available to promote good housekeeping and these are regularly updated and replaced to keep the message fresh. Staff are encouraged to take part in University-wide initiatives such as the Green Week and Climate Week as well as the annual Fairtrade Fortnight. The combined impact of all the above initiatives and actions is noticeable. This can only build as the message gets across and sustainable behaviour becomes mainstream. The profile of the project was raised in May 2012 when the “Queen’s University’s Environmental Champions Programme” won the “Environmental Project of the Year” at the “Sustainable Ireland” awards.

## 6 Conclusion

Libraries as a building type have a major environmental impact and sustainability should undoubtedly be a key component in any contemporary library design project. Indeed, as Wagner and Scherer point out in their chapter in the *IFLA library building guidelines*, “Sustainable practices should be applied in all phases of the life-cycle of a building including building operation and management” (Wagner & Scherer 2007, 203). Edwards also stresses that sustainability should be considered “not just in the physical sense, but in terms of social and cultural sustainability” (Edwards 2011, 214).

We feel we have achieved this with The McClay Library project at Queen’s University although, of course, there is no room for complacency. Sustainability was a critical factor in the design and construction of the building in line with the University’s environmental policy and it continues to inform decisions in the day-to-day management of the building in use. Performance is monitored and reviewed against targets, we educate and empower our library staff members through the Green Impact Scheme and we encourage our students and staff to adopt an environmentally responsible attitude in relation to library use. The library has proved highly popular with users with a significant increase in use. The average weekday footfall is between 8,000 and 10,000 with peak occupancy in the region of 1,150. Sustainability not only makes economic and ecological sense; it also ensures that users enjoy working in a pleasant environment conducive to study and one which, through sustainable architectural design, clearly demonstrates best practice and conveys a message and values to which they can wholeheartedly relate.

I should like to thank the Queen’s University Director of Estates, Gary Jebb, and his staff, and all my colleagues involved in the Green Impact Scheme for their invaluable help in providing information for this chapter.

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